Continental J. Veterinary Sciences 4: 23 - 30, 2010 ISSN: 2141 – 4041
 http://www.wiloludjournal.com

NEXUS BETWEEN AVIAN INFLUENZA OUTBREAK AND DEMAND FOR CHICKENS IN BAUCHI METROPOLITAN LIVE BIRD MARKETS

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ABSTRACT
The study examines the impact of Avian Flu outbreak on the demand and price levels of chickens in Bauchi metropolis, Nigeria. Thirty marketers were randomly selected from five selected live bird markets. The data collected using questionnaire was analyzed using percentages, student's t-test and chi-square analysis. Results indicated that majority of the respondents were between 31 – 45 years of age (43.33%), had ₦10, 000 ₦ 50,000 or $77 - $385 each as capital (63.33%) and have more than 5 years of marketing experience. Markets' sales of 16.16% and markets' price of 60.43% of the base week's quantity and price were recorded during the 3rd – 4th weeks of the outbreak. The study also, revealed that total price changed to 74.06% of the base week's price, while both the demand and price levels after the outbreak were found to be significantly ($p<0.05$) different from before. Furthermore, the results disclosed that the sales of different sizes of chickens during the outbreak were dependent ($p<0.05$) on markets locations. The study confirmed that the outbreak brought changes in the demands and prices of chickens in Bauchi city, thus, the need for soft loans / input subsidies to the affected entrepreneurs and public enlightenment campaigns on the wholesomeness of well-cooked products of even infected birds are recommended.

KEYWORDS: Nexus, Avian, Influenza, demand, markets.

INTRODUCTION

Background of the Study

The share of agriculture in Nigeria's Gross Domestic Products (GDP) is 34.76 per cent while the livestock sub-sector accounts for 19 per cent of the agricultural GDP and 5.83 per cent of the national GDP (CBN, 2005). The goal of the sub-sector is to attain self-sufficiency in the production of livestock and livestock products, to meet the protein needs of the country and to improve the economic well-being of producers and consumers. Poultry products, in particular, provide an acceptable form of animal protein to most people throughout the world (Smith, 2000). The poultry industry, in Nigeria, comprises of two types of producers: local and modern poultry farmers. The local poultry, observed Igue and Oguntade (2006), is characterized by small flock size, slow growth rate, hardiness, late attainment of maturity and resistance to most prevailing diseases. The modern poultry, on the other hand, is characterized by multitudes of birds managed with modern technologies of feeding, medication, vaccination and restriction in battery cages. Poultry production plays vital roles in maintaining the protein balance of human population in addition to serving as a source of income and employment to many people. Nigeria has an estimated population of over 133 million poultry which is a major source of animal protein supply to the citizenry. It has the highest labor generating capacity apart from crop farming and serves as means of livelihood for over one million families (Igue and Oguntade, 2006). Nigeria's annual production has risen to 580,000 table eggs and 110,900 metric tonnes of Poultry meat (CBN, 2005). Further, the average output of livestock and poultry products were put at 2.91 and 0.603 million tonnes per annum respectively during the 2000-2005. Poultry constituted 27 per cent of the total livestock products during the period under review. It has been estimated that between 10 and 25 per cent of total poultry meat and eggs consumed annually in Nigeria are supplied by the modern poultry farms while the rest is supplied by rural scavenging poultry and imports. However, according to Hamidu (2006), the consumption of animal products is very low in Nigeria compared to standard daily requirement of 35g-45g. This contributes to shorter life span, lower health status and lower productivity of Nigerians, as observed by Oluyemi (2002). In Nigeria, prices of poultry meat are high and thus only few farmers are in the business. The reason for this is not far fetched as feed, which constitutes, roughly, 70 per cent of the cost of production has become more expensive. (Kekeochi, 1984).

One of the serious constraints to poultry production and distribution is frequent outbreak of diseases. The highly pathogenic avian influenza (HPAI) outbreak globally was reported in June 2004 in some Asian countries. Since February, 2006, cases of Bird Flu infections in poultry or wild birds have been reported in many countries including Iraq, Azerbaijan, Bulgaria, Greece, Italy, Slovenia, Iran, Austria, Germany, Egypt, India, France, Slovak Republic, Switzerland and Nigeria (WHO, 2006). In Nigeria, the highly pathogenic H5N1 avian influenza was confirmed among poultry farms in 13 States and the Federal Capital Territory in 2006 (Igue and Oguntade, 2006). The strain *H5N1* affected poultry farmers in the country including Bauchi, the Bauchi State capital in Nigeria (Anonymous, 2006). However, fear about zoonotic impact of the disease reduced demand for poultry products in the country. WHO (2004) estimated that between 2.0 – 7.4 million human deaths could be caused by a new influenza pandemic and also reported that the then situation with avian influenza (*H5NI*) had satisfied two of the prerequisites of the start of a new human influenza pandemic three times in the last 8 years. It is against the afore- mentioned background that this study attempts to examine the impact of the 2006 outbreak on the demand and price levels of chickens in Bauchi metropolis. Some of the questions raised by the study are what proportions of chickens were demanded and proportions of prices obtained during the outbreak as compared to before? Were there statistically significant differences in demand and price levels between the "*before"* and "*during"* the outbreak and were the sales of different sizes of chickens dependent on markets' locations in the metropolis.

Conceptual Framework

Avian influenza outbreak can cause consumers of poultry products to panic and hence to change their behavior; and this can make chicken consumption and consequently demand to fall in the affected areas. Further, when the amount of reduction in chicken consumption (demand) is significant, chicken prices start to fall in the affected areas, particularly where price elasticity is high. Furthermore, in places where poverty, malnutrition and unawareness are endemic, the fallen prices triggers increased demand of the commodity by the poor, malnourished and unaware segment of the populace.

METHODOLOGY

The Study Area

Bauchi, a city in northern Nigeria, is located between Latitudes 90^0 30'N and 12^0 30'N of the equator and Longitudes 8^0 42'E and 11^0 50'E of the Greenwich Meridian. It has a total population of 493,810 (NPC, 2006). The vegetation of the area is open woodland with trees up to six meters or more (Anavhe, 1998). It covers an estimated land area of 65,216 km^2. It has distinct wet and dry seasons. The wet season spans from April to October, while the dry season commences in November and terminates in March. The temperature is generally high in the wet season and lower in the dry harmattan period, ranging from 45°C to as low as 15°C - 20°C (BSADP, 2004).

Sampling Procedure

Firstly, five markets were purposively selected based on preponderance of chickens traded. Secondly, six (6) traders were randomly selected, using simple random sampling technique, from each market making a total of thirty (30) trader- respondents.

Data Collection

Using questionnaire, data were collected on respondents' socio-economic characteristics as well as on demand and prices of chickens before and during the outbreak of the disease in the area.

Tools of Analysis

These are percentages, correlated student's t-test and chi-square analysis. Percentages, according to Adamu and Johnson (1997), are ratios expressed with 100 as the denominator. Thus, price relative, commonly used in the analysis of simple products, was employed and is given as:

$$P = \frac{P_1}{P_0} \times 100 \quad \text{.....} \quad (1)$$

Where,

P = price relative

P_1 = price of chickens in a given week after the outbreak

P_o = price of chicken in the base week before the outbreak

The price relative value indicates by what proportion the price of chickens has changed over that of the base week i.e. the week before the outbreak.

Same tool was employed to calculate changes in the number of chickens demanded after the outbreak relative to before. Thus, this was computed as:

$$Q = \frac{Q_1}{Q_0} \times 100 \quad \text{..... (2)}$$

Where,

Q = quantity relative
Q_1 = number of chicken sold in a given week after outbreak
Q_0 = number of chickens sold in the base week before outbreak

According to Pagano (1994) , the simplest experiment of Student's t- test for correlated groups uses two conditions , often called *control and experimental* , o*r before and after.* Thus, this tool is used in this study to examine whether or not significant differences occurred in terms of quantities demanded and prices offered before and after the *H5N1* disease outbreak in the study area. The student's t-test is given as:

$$t = \frac{X_1 - X_2}{S E_{X1 - X2}} \quad \text{..... (3)}$$

Where,

X_1 = Mean value after the disease outbreak
X_2 = Mean value before the disease outbreak
$SE_{X1 - X2}$ = Standard Error of the Difference between X_1 and X_2 .

In this type of test, if the calculated t- value is greater than the tabulated value of t at the specified level of significance and degree of freedom; the null hypothesis, Ho, is rejected in favor of the alternative hypothesis, H_1.

Chi-square analysis is used to, among others, test if two variables are independent or not (Mohammed, *et al.* 2005). Hence, the tool has been used to find out whether the sales of different sizes of birds during *H5N1* disease outbreak were dependent on markets locations or not. Thus, the chi-square statistic calculated from the sample data is given by:

$$X^2 = \Sigma (fo - fe)^2 / fe \text{..... (4)}$$

Where,

X^2 = Chi – square value
Σ = Summation
Fo = frequency of observed values
Fe = frequency of expected values

If the calculated chi-square value is greater than the tabulated value of chi-square at the specified level of significance, and degree of freedom, the null hypothesis, Ho, is rejected in favour of the alternative hypothesis, H_1.

RESULTS AND DISCUSSION

Respondents' Socio-economic Characteristics

This section examines the socio-economic characteristics of respondents based on the reason that decision making of market participants is often influenced by their socio-economic characteristics such as age, length of experience, family size, as well as the volume of capital involved in carrying out marketing activities (Murtala, 2009).

Table 1: Socio-economic Characteristics of Live Birds Marketers in the Study Area (n = 30)

Variable	Frequency	Percentage
Experience (Years)		
<5	5	16.67
5-10	8	26.67
11-20	9	30.00
>20	8	26.67
Family Size (No)		
<5	6	20.00
5-10	9	30.00
11-20	9	30.00
>20	6	20.00
Age (Yrs)		
18-30	9	30.00
31-45	13	43.33
46-60	8	26.67
Capital ($)		
< 77	2	6.67
77 - 385	19	63.33
386 - 769	4	13.33
> 769	5	16.67

Source: Field Survey, 2006

Table 1 depicts that 43.33 per cent of the traders were within the age bracket of 31-45 years while 30.00 per cent were between 18 – 30 years of age. The implication of this is that respondents were in their active age and can, therefore, be very productive and take risk in anticipation of high returns.

The number of years a trader spends in his/her business gives an indication of practical knowledge, which he/she has acquired over years. Hence, it is possible to have an improvement in the marketing activities in terms of better marketing services therefore playing a great role in influencing marketing efficiency. Table 1 also indicates that only 16.67 per cent of the respondents had less than 5 years of marketing experience while those with greater than 20 years experience were represented by 26.67 per cent. Traders who have longer years of experience in carrying out marketing functions might have mastered it, thus becoming more efficient through trial and error over time.

Family size is known to have a significant influence on the traders' activities because of the ready availability and supply of needed labour. The larger the family size, the higher the family labour availability and vice versa. It can be seen that majority of the respondents (30.00% each) fell from 5-10 and 11-20 ranges of family size. Family size, in this study, is made up of the respondent himself, his wife/ wives, children and all other persons who depended on him.

The growth of any enterprise is a function of capital investment. The Table also shows that 63.33 per cent of the respondents acquired $ ~~77~~ – $385 as capital volume while 6.67 per cent of them owned less than $77 as capital investment. The implication of this is that traders might not be able to handled large volume of chickens at a time due to capital constraints.

Proportions of Chickens Demanded After Outbreak in Relation to Before

Table 2 shows that, in the first two weeks of the outbreak, only 24.11 per cent of the base week's number of chicken was sold. This fell to 16.96 per cent in the third and fourth weeks.

Table 2: Number of chickens sold in markets after outbreak compared to before (n=30)

Weeks	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16
Number of chickens	112	27	19	47	64	80	94	105	109
Relative Quantity (%)	100	24.11	16.96	41.96	57.14	71.43	83.93	93.75	97.32

Source: Field Survey Data, 2006

Thereafter, the proportion continued to subsequently increase up to the end of the study period in weeks 15^{th} -16^{th} where 97.32 per cent of the base week's number was marketed.

Weekly Relative Prices of Chickens During the Disease Outbreak (Week 0 = 100)

Table 3 depicts that the lowest relative price (60.43% of the base week) was recorded in weeks 3-4. This, probably, was because in the 1^{st} and 2^{nd} weeks awareness about the outbreak was not much created among consumers in the study area. The relative price continued to increase up to weeks 15-16 (102.17%). This means an increase of 2.17 per cent over the base week's (100%) price.

Table 3: Prices of chickens during the outbreak compared to before (n =30): By weeks

WEEKS	0	1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16
PRICE (₦))/ Crate	369	300	223	287	314	337	342	356	377
RELATIVE PRICE (%)	100	81.30	60.43	77.78	85.09	91.33	92.68	96.48	102.17

Source: Field Survey Data, 2006

Total Relative Prices of Chickens During the Disease Outbreak
Table 4 indicates the price changes of small, medium and large size chickens combined in the study area and over the study period.

Table 4: Total relative prices of chickens during the disease outbreak (n = 30)

Product	Price		Quantity		Price X Quantity			
Chicken	P_0	P_I	Q_0	Q_I	P_0Q_0	P_IQ_0	P_0Q_I	P_IQ_I
Small	216	171	27	21	5832	4617	4536	3591
Medium	342	294	33	23	11286	9702	7866	6762
Large	549	375	52	24	28548	19500	13176	9000
Total					45666	33819	25578	19353
Mean					15222	11273	8526	6451

Source: Survey Data, (2006),

Thus, the total relative price of chickens during the disease outbreak is given as:

$$P = \frac{\sum P_I Q_O}{\sum P_0 Q_0} \times 100$$

$$= 74.06\%$$

The total relative price was found to be 74.06 percent of the base price. This means an average price fall of 25.94 per cent was observed due to the outbreak compared to the base price (100%-74.06%).

Test For Significant Differences in Demands and Prices Before and After the Outbreak
This item examines whether there were significant differences in prices and quantity demanded of chickens after the outbreak compared to the situation before. Hence, correlated student's t- test was employed and the results are shown in Table 5.

Table 5: Before and After Outbreak Comparison in Demand and Price Levels (n = 30)

Variable	n-size	$X_1 - X_2$	t- Value	Decision
Demand for Chickens	30	36.18	2.76*	Reject null hypothesis
Prices of chickens	30	267.68	7.74*	Reject null hypothesis

Significant at 0.05
Source: Field Survey Data, 2006

The result disclosed that, both the demand and Price levels of chickens were found to be significant ($P<0.05$). This means that there were significant variations in the quantities purchased and the prices offered before and after the outbreak during the study period. According to Igue and Oguntade (2006), the drop in the demand for poultry products by Nigerians during the outbreak could worsen the nutritional level with respect to nutrient of the nation and affect the health of some Nigerians.

Relationships Between Sizes of Chickens Sold and Markets Locations
This section examines whether there was significant relationship or association between different sizes of chickens sold and markets. In other words, whether the different sizes of chickens sold within the period of outbreak were dependent on the markets' locations. Accordingly, the result is shown on Table 6.

Table 6: Association Between Number of Different Sizes of Chickens Traded and Market Locations (n=30)

Market	Size (kg)			
	Small (1.0-1.4)	Medium (1.5-1.9)	Large (2.0-2.5)	Total
Muda Lawan	356	414	390	1,160
Central	339	305	365	1,009
Wunti	305	436	443	1,184
Railway	296	307	375	978
Yelwan Tudu	249	305	300	854
Total	1,545	1,767	1,873	5,185

Source: Field Survey Data, 2006
5% level of significance ($p<0.05$)
Chi-Square Cal = 26.75
Chi-Square Tab = 15.51

Since the value of chi-square calculated (26.75) is greater than the value of chi-square tabulated (15.51) at 5% level of significance, it is concluded that the sales of different sizes of chicken were determined by the locations of the markets.

CONCLUSION AND RECOMMENDATIONS
The paper examined the effect of AI outbreak on demand and prices of chicken in Bauchi metropolis, Nigeria. It is confirmed that the bird flu outbreak in 2006 brought changes in the demand, and prices of chickens in Bauchi city, Nigeria. Thus the study recommends soft loans to the affected traders in addition to Mass public campaigns to enlighten consumers on the wholesomeness of well-cooked products of even infected poultry birds and preventive measures against further outbreaks.

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Received for Publication: 10/11/2010
Accepted for Publication: 30/12/2010

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